



Palo Alto Research Center Inc
**TRANSENSOR: Transformer Real-time Assessment
Intelligent System with Embedded Network of Sensors
and Optical Readout**

Project Description

Palo Alto Research Center will develop, prototype, and demonstrate, *TRANSENSOR*, an innovative, low-cost, optically based smart monitoring system initially targeted at network distribution transformers. It will increase the capacity of grid infrastructure to accommodate distributed energy resources (DERs) by enabling transformer comprehensive real-time performance / health monitoring; thereby enhancing safety without sacrificing performance. *TRANSENSOR* will combine embedded fiber optic sensors and intelligent model-based algorithms to interrogate key internal parameters, infer state information, and predict safety-critical conditions and remaining life of distribution transformers. The algorithms will exploit the sensors for effective transformer monitoring, enabling utilities to pivot to predictive condition-based asset maintenance.

Goals/Objectives

- Develop innovative low cost remote monitoring for distribution transformers enabling real time & predictive health assessments of those units.
- Enhance safety while enabling higher equipment performance levels.

Key Milestones

- Laboratory-level development and testing: first in component-level bench-top transformer studies, then lab-level validation in accelerated stress tests, and finally factory tests of full scale transformers using *TRANSENO*R. (Dec 2018)
- A six-month field demonstration completed at a Con Edison pilot network customer in New York with more than two feeders and DERs. (Dec 2019)

Benefits

- Mitigate issues introduced by higher DER penetration levels such as: load forecast errors and increased grid topology complexity with resultant inadvertent system dynamics, safety, and planning uncertainties.
- Enable utilities and their customers to fully exploit key DER benefits—such as energy savings, avoided system losses, and deferred or avoided investments—while improving distribution system resilience.

Milestone	Completion Date
1: Acceptance of <i>TRANSENSOR</i> functional specification	December 2017
2: Develop optimal sensor combination and configuration options	March 2018
3: Qualification of <i>TRANSENSOR</i> -enabled network transformers	December 2018
4: Publish & present <i>TRANSENSOR</i> concept & validation details	June 2019
5: Completion of field demonstration at the utility	December 2019

CONTACTS

Ajay Raghavan
Principal Investigator
3333 Coyote Hill Rd
Palo Alto, CA 94304
650-812-4724
Ajay.Raghavan@parc.com

David Szucs
NETL Project Manager
626 Cochrans Mill Road
PO Box 10940
Pittsburgh, PA 15236
412-386-4899
David.Szucs@netl.doe.gov

PARTNERS

General Electric Grid Solutions
Consolidated Edison Co of New York

PROJECT DURATION

10/01/2017 – 12/31/2019

BUDGET

Total Project Value
\$2,121,273

DOE/Non-DOE Share
\$1,499,956 / \$621,317

PROJECT IMPACTS

- Successful demonstration of *TRANSENSOR* would likely enable cost effective remote monitoring of not only network distribution transformers, but also of other distribution transformers of smaller size / cost.
- *TRANSENSOR* could more generally enable remote monitoring of various distribution grid assets where existing monitoring options are too expensive or ineffective.
- *TRANSENSOR* distribution grid applications, where the monitored equipment is subject to the uncertainties / complexities of DER loadings could support increased DER penetration with improved grid resilience.

CID: OE0000872

*Managed by the National Energy
Technology Laboratory for the Office of
Electricity Delivery and Energy Reliability*

